

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

JUNE 30, 1952

50 CENTS



PICTURE OF OUR "FLEX SHOP" IN ACTION!

This Flexible "Shop," a small part of which you see here, is an important part of our aeronautical controls production line. Completely tooled, it is an integrated setup for the machining of parts, assembly, and inspection.

If we're called upon to get out a rush order for electronic fuel gauges, autopilots, jet engine controls, or any other of our line of aeronautical controls—or if any parts are needed quickly to break assembly bottlenecks, we call on these men and these machines.

Thus, we can handle special orders with a minimum lead time and without upsetting our regular production lines. That's why we

call this plant area our "Flex Shop."
This special shop is a good example of the quality of planning and organization that has gone into all our engineering and production thinking here at Honeywell.

Plans to improve our engineering and production techniques are constantly being made by our staff—because *automatic control* is such an important part of aviation progress.

And *automatic control* is Honeywell's business.

MINNEAPOLIS
Honeywell

Aeronautical Controls



STANDARD EQUIPMENT

- Hydro-Aire's AN 5200 Series of Hydraulic Pressure Relief Valves are today Standard Equipment on the majority of America's military and commercial airplanes—a tribute to the high regard the aviation industry has for Hydro-Aire's engineering, testing, and manufacturing ability.
- In addition to Hydro-Aire's many standard equipment hydraulic components, H-A engineers and laboratory technicians are constantly working with America's leading aircraft companies in the solution of individual problems.
- From the precision manufacturer of parts long proved and accepted, to engineering discussions of problems far ahead, is the role H-A plays in Hydro-Aire—as in many phases of aviation manufacture and research.

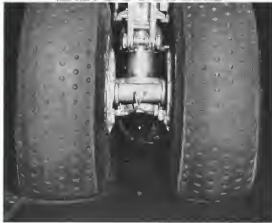


HYDRO-AIRE
for
HYDRAULIC PRESSURE
RELIEF VALVES

HYDRO-AIRE

BUSINESS FIGHTERS, CRUISE DOMESTIC, JETLINER, TRANSPORT — HYDRO-AIRE EQUIPPED

B.F. Goodrich



20 airlines switch to new B. F. Goodrich dimpled fire

WE RECENTLY ANNOUNCED that nine airlines had agreed and switched to the new B. F. Goodrich dimpled fire. Now eleven other airlines report that they have adopted it as standard equipment.

One airline reported 20% more loadings on DC-4's. A typical report from one on a fleet of DC-3's: "We removed the tires after 400 hours, 1200 loadings. In the process of retying, we discovered that there was enough rubber left for about 100 hours more, a total of 1300 loadings."

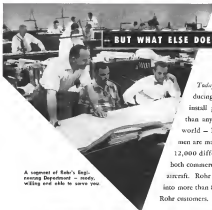
The new B. F. Goodrich dimpled fire

has a longer loading and cushioning which cuts down vibration. It has a new tread with dimple-like indentations in the rubber. These dimples provide better distribution of the tire load and relieve exposure to road cutting. Retreading is simpler. Cases of rejection are fewer.

The airlines loading on BFG dimpled tires include: American, Braniff, Capital, Coastal, Continental, Empire, Frontier, Hawaiian, Mid-Continent, National, Northwest, Northwest, Pan-American, Philippine, Western Southern, Southwest, Trans-World, United and West Coast.

B. F. Goodrich is now producing the dimpled tire in seven sizes and runs. The new, longer wearing dimpled tire is another example of BFG's leadership in rubber research and engineering. Other B. F. Goodrich products for aviation include wheels and brakes, landing wheels, DeSoto, Avco, Plastibloc, shockers, Pressure Sealing, Zipper, variable seats, fuel cells, Ejectors, accessories. The B. F. Goodrich Company, Akron, Ohio.

B.F. Goodrich
FIRST IN RUBBER



A segment of Rohr's Engineering Department - ready, willing and able to serve you.

BUT WHAT ELSE DOES ROHR DO?

Today - besides producing more ready-to-install power packages than anyone else in the world - Rohr Aircraftsmen are making more than 12,000 different parts for both commercial and military aircraft. Rohr assembles these into more than 840 products for Rohr customers.

ROHR



WORLD'S LARGEST PRODUCER

OF READY-TO-INSTALL POWER PACKAGES
FOR AIRPLANES

ROHR

AIRCRAFT CORPORATION

In Chula Vista, California 8 miles from San Diego

NEWS DIGEST

Domestic

Douglas jet transport details are expected to be announced soon, according to an authoritative London source, which reports that Douglas Santa Monica chief engineer E. F. Burton and commercial sales manager Nat Fawcett have dropped word of a new "DC-1" in order during a recent tour of Europe. The British are said to be "nervous" feeling such an announcement may influence future D40 Comet sales. American Airlines reportedly has given Douglas a verbal commitment for a quantity of jet airplanes and is said to favor a straight rather than swept wing to permit higher gross loads and to keep landing speeds down. Although the 90W-107 reportedly has received the nod by the new Douglas transport, General Electric also has filed controversy with Douglas and American Airlines.

EML decried Air Transport Association last week, with E. V. Beckenbach, chiefing ATA director for not granting Executive Vice President Robert Rosenfeld enough extension of his leave of absence from ATA. Rosenfeld has been chairman of the Civil Service Commission for a year at President Truman's request. Following ATA action, Rosenfeld announced he is quitting his ATA post and will return to Civil Service Commission. ATA directors stated they couldn't agree with Rosenfeld on employment terms and he "relinquished his resignation."

First Boeing KC-97F Superfortresses are being delivered to USAF. New test bases include F4W 34408751 having redesigned cylinder heads, constant, crankshaft, exhaust manifold and ignition system. Bendix-Sylvania graphic analyzers are also fitted. KC-97Fs are convertible troop or cargo transports, transport planes in small numbers.

Airport traffic study is being sponsored by Port of New York Authority, which awarded \$16,000 contract to Bell, Bernmark and Newman of New Jersey, Minn. to make out the research. The company will also prepare recommendations, plans and specifications for air traffic devices following its study of NYNJA's fields.

U. S. civil plane reports during May totaled 25 units valued at \$109,832. Total for first five months of year set 146 and \$3,147,290 respectively.

William R. Rabinovich has been elected vice president of United Aircraft Corp.

Rabinovich is controller and Operating and Policy Committee member. Other UAC changes include promotion of Bill Martin, Hinesville Standard division general manager, to vice president.



GOODYEAR ZP-4, largest aircraft ever built, is sent being hoisted toward runway just following arrival at Lufkin, N. J., Naval Air Station June 15. It was flown from Alaska by civilian crew for delivery to Navy.

It is 128 ft long, has a gross weight of 875,000 lbs. Engines are 400 hp. Wright R-3400s mounted in exhaust for easy accessibility. Props are driven by extended shafts running out to nacelles.

Building of orders for aircraft engines and propellers at of May 31 totaled \$13,604 million, with orders for aircraft and parts comprising 615%.

U. S. only may manufacture compared 94% of the aircraft, 94% of engines and 78% of props on order.

Financial

Northwest Airlines paid \$2,686,135 in taxes during 1951, with \$2,575,856 going to taxing states in the U. S. and \$10,276 to foreign countries.

Mid-Continental Airlines reports \$7,468 net loss for April after adjustment for federal income taxes, with first quarter loss being \$93,012, including additional mail pay the carrier expects to receive when pending mail rate proceedings are concluded.

Panair Airlines is paying a 15-cent-per-hour dividend June 29 in addition to June 18. PAA's earnings for the first five months of 1952 were \$595,431. It sold as 11 DC-3s for \$691,091.

International

Sw SAAB Scania transports are to be built under license by Fokker, Amsterdam, which will be assisted by de Schelde and Avions des Industries. The 24-32 passenger transport aircraft was built in limited quantity in Sweden after World War II for Scandinavian Air Lines and British Vesp. Although SAAB reportedly has received orders recently for the plane, it is understood its delivery commitment provided removal of production in Sweden.

Boeing is available at Grissold AFB "was in no way due to the failure of any transport part" of the landing gear. Co. was told the matter, Cleveland Pacific Traffic Tool Co. The report and that after the plane passed the runway on its initial touchdown the landing gear "held until partially torn loose from the aircraft structure fittings."

Civil aircraft shipments during April totaled 200 planes valued at \$15.5 million and aggregating 718,700 lbs. During April 493 engines totaling 322,600 hp and valued at \$4.6 million were shipped.

Glenn I. Martin Co., Middle River, Md., is shutting down plant during period July 25 Aug 10 inclusive.

Rudder Pedal Adjustment AIRBORNE actuated



An R-622M1 actuator and two R-532 jack screws, connected with flexible shafting, comprise the rudder pedal adjusting system on one of the latest fighter planes.

Long association with the industry and wide experience in the design and development of electro-mechanical equipment for aircraft enable us to meet the rigid requirements of such an application. Let us help you with your problems, too. See our data in the I.A.S. Aeronautical Engineering Catalog.

AIRBORNE
ACCESSORIES CORPORATION
1414 Clinton Avenue, Buffalo 6, New Jersey

AVIATION CALENDAR

- July 1-5**—American Meteorological Society national meeting, including joint session with the Institute of the Aeronautical Sciences, Hotel Statler, Buffalo, N. Y.
- July 1-5**—Northwestern States Sealing Meet, Elmer, N. Y.
- July 4-9**—Ninety-Minute all-terrain transportation air race from Santa Ana, Calif., to Washington, D. C.
- July 6-12**—Aviation Writers Ass., annual convention, Ambassador Hotel, Los Angeles.
- July 16**—Regional air safety forum sponsored by Corporation Aircraft Owners Ass. of Long Beach and CAA, theme to be "Weather Flying", Santa Ana, So. Cal.
- July 16-18**—Institute of the Aeronautical Sciences annual summer meeting 185 Western Headquarters Building, Los Angeles.
- July 18-20**—Western Flight of America national convention, Chattanooga, Tenn.
- July 18-25**—Silver anniversary celebration, Fukuoka City of Aeronautical Technology, Fukuoka Airport, Fukuoka, Japan.
- July 18-28**—University Aviation Ass. 46th annual meeting, Ball State Teachers College, Muncie, Ind.
- Aug. 13-15**—Society of Automotive Engineers national West Coast meeting, Piedmont Hotel, San Francisco.
- Aug. 17-19**—National Flying Bureau convention, Alabama Polytechnic Institute, Auburn, Ala.
- Aug. 16-Sept. 1**—International Aviation Exposition, sponsored by Aero Club of Michigan, including Conquest Motor "Triple Race", Wayne State Airport, Detroit.
- Sept. 1-5**—Society of British Aircraft Constructors annual display, Farnborough, England.
- Sept. 6**—Confederal of Engineering Tempers, Hotel Rawlstonboro, Chicago.
- Sept. 9-12**—Instrument Society of America seventh national instrument conference and exhibit, Cleveland.
- Sept. 14-15**—Aeronautical Pac. Pacific Airport, Milan, Italy.
- Sept. 15-19**—International Air Transport Ass. - eighth annual general meeting, Geneva, Switzerland.
- Sept. 25-Oct. 1**—National Elevator Constructors, Sheraton Hotel, Chicago.
- Oct. 1-4**—Society of Automotive Engineers national symposium meeting, aircraft engineering display and aircraft performance forum, Hotel Statler, Los Angeles.
- Oct. 9-10**—Airport management operations conference, Oklahoma University, Norman, Okla.
- Oct. 25-Nov. 2**—International aviation and hotel exposition, Navy Pier, Chicago.

PICTURE CREDITS

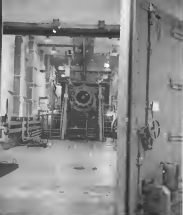
5—Walt Wolfe; 6—Photo-20 Aircraft; 15—USAF.



New Details of C-119H Packet

Flight tests have been started on the C-119H, latest Fairchild Packet for the USAF, and early reports are that its performance exceeds that of earlier models in many respects. Its two Wright R3300-50W compressed engine power, installed over a 56-ft. wingspan, within 2,000 ft. and landing distance of 1,500 ft. The prominent sail-wing Ryan-built fuel pods are one of the plane's more noteworthy features, eliminating external tanks of fuel. They possibly will be viewed with interest by other transport plane makers not only because they promise to reduce the fire hazard as prime fuel is stored in fuselage tanks but for their weight economy. In the C-119H they save 600 lb. through economies in reduction of fittings, connections, struts and the like. Simplification of wing structure is also possible.





"Super wall" is development area for engine parts. General Electric is now in production. To try these new tools for production engines has also been added.



New office building is planned for jet engine, fuel system and other activities in efficiency.



New machine parts press in efficiency of 1000 units. Machine assembly line this speeds jet production.



Test will control jet in "test" on engine, engine and supported in jet in house turbine engine.

JET CENTER, U.S.A.

Nearly four million square feet of floor space, employment approaching 8000, and some of the most modern and complete jet-producing facilities in the world make up "Jet Center, U.S.A." the new General Electric plant at Lockland, Ohio. Dedicated on the tenth anniversary of the first American jet engine, this new jet plant will be a tremendous factor in the future of American aviation.

Lockland provides for rapid expansion to meet national emergencies as well as a foundation for peacetime production. While its recent rapid growth has been due mainly to the demands of increased aircraft production, Lockland will continue to spearhead the progress of aviation and to maintain national security. Features of the new plant are a new parts production building and a new engineering and administration

building, both recently completed, and a new Components Development Center now under construction. One large building, previously used for assembly of production engines, is now devoted to development work to bridge the difficult gap between experiment and production. Two huge new test cells, with a common control room, have been built especially large to accommodate engines of extremely high thrust ratings.

During the fastest ten years in history, jet engines designed and developed by General Electric have powered more planes, set more records, and flown more hours than all other U.S. jets combined. Now, with this experience, a series of skilled workmen and the new facilities available at Lockland, General Electric works for the future.

40-40

You can put your confidence in—

GENERAL ELECTRIC

WHO'S WHERE

In the Front Office

W. L. Brown has been vice president of the Sperry Corp. since 1947. Before joining Sperry in 1945 as director of research engineering.

Robert W. Richardson, assistant president, Chrysler Corp. & Fisher Co., has been named assistant president of Fisher Springfield Tool Co., Connecticut. Mr. Richardson was manager of Chrysler's Automotive Products division from 1941 to 1951.

B. A. Rapier, formerly vice president in the Aircraft Division, Hughes Aircraft Co., has been named vice president of Hughes Aircraft Co., in charge of manufacturing.

Changes

Amos E. Speed, formerly with the USAF in various posts, has joined Republic Aviation Corp., Farmingdale, N. Y., as director of the contracts division.

Mr. Charles De Anza has been appointed public relations director of the Aerojet Corp., Azusa, Calif.

Robert M. DeWitt has joined Power Aircraft Co., Clinton Heights, Pa., as product engineer.

William S. Kuhn has been designated field engineer for "Sudair," Inc., Newark, N. J., and Harry Tarkenton has been promoted to a senior representative.

Blair M. Berry has joined the Tulsa division of Douglas Aircraft Co., and will be based at Wichita in connection with L. C. Selberg as the S-47 Protection Committee.

F. Murray McGuire has left Trans-Canada Air Lines as assistant manager of the Atlantic division to join Canadian Pacific Airlines as director of development.

Raymond G. Anderson has been appointed chief sales representative of the Aerojet Corp. for Northwest Airlines. Other new regional representatives are Arthur T. Peterson (Western) and Paul L. Kuehn (East).

Earl E. Calkins has been made United Air Lines' representative of mail and express, according to Los Angeles, United.

Robert Smith has been named special representative of Westinghouse Aircraft Division, O. H. Reynolds Metals Co., Louisville, Ky.

Norman F. Tard has been made quality manager of Aerojet division, General Motors Corp., Dayton, O.

Honors and Elections

Leon J. Smith, Dallas area representative for J. H. & H. Co., Inc., has been elected president of the National Association of Manufacturers' Representatives. Don D. Roberts has been made vice president. Shelia Coleman, Wichita representative, has been appointed to the board of directors of General Aircraft Co., succeeding the late Will G. Price, Jr.

INDUSTRY OBSERVER

►Panda Helicopter Corp. is going through the performance of CAA certification of the USAF H-21 Waddlers. Panda hopes to have the big tandem rotor machine certified in about six months, or at least will believe current military orders will permit any civilian deliveries to be scheduled.

►Side-by-side seating will be featured on the two delta trainers Aero is building (Aviation Week June 8, p. 7). The new trainers will closely resemble the 707A and 707B aircraft the company has been flying successfully for some time.

►Powered Allison J71 engine, not now expected to be used in a production version of the Insurgente Boeing B-57C, is slated for installation in a later version of the Northrop F-89 two-engine all-weather interceptor. Installation should step up the performance of the already fast climbing F-89 considerably, since the new J71s are in the 10,000-hp thrust bracket. Current Allison J55A-21 installation in the F-89D is in the 6,000-hp thrust class.

►Production September 1955 two-engine-powered Night fighter will have swept wings and probably a conventional tail, British Admiralty has tentatively suggested. Prototype 596 has straight wings and "V" tail.

►Air Force is finishing details of a policy designed to encourage the use of interim as production of aircraft and engine equipment. Policy, adopted by AMC and approved by USAF Chief of Staff, will provide for replacement to be covered as "in line" change of the aircraft, not involved in the use of interim. It is expected that the policy will stimulate interest use of interim and its increased production.

►First two S-55 helicopter designers have been completed by Westland Aircraft Ltd., which is building the craft under Sikorsky license. Westland will support engines from Pratt & Whitney since an interchangeable British powerplants are available. These have been talk of Alvis working out a ductile Lanchester installation for the Westland S-55.

►Cessna is tapping all the modernization program of its S-36 bombers at San Diego in December, after which the program transfers to Ft. Worth to be carried out simultaneously with production of additional S-36s there. Shift of personnel to other San Diego projects has already started, including redesigning S-36 Navy version helicopter plane, the Army S-36 commando helicopter, S-36 Air Force transport helicopter, trainer, and the prototype XF-102 delta wing aircraft carrying interceptors.

►Victory Vietnam helicopter project is due to be processed for use as national assets in India, with a Vietnam study mission on its way to that country. The Indian government has announced its intention to develop an aircraft with either the Viscount or Constellation and the former series to have the edge because of its helicopter power and a striking price tag.

►First production North American F-27 F-27 has been flown to Patuxent Naval Air Station from Los Angeles well ahead of schedule. Second F-27 is due at Patuxent shortly. The seventh jet fighter, equivalent of the Air Force F-46 Sabre, except for certain leading equipment and flying wings, are scheduled for carrier qualification flights in soon as they complete performance at Patuxent.

►Aeroproducts Division, General Motors, settled by dip in their turbo-prop controls, but made up a demonstrator jet from out of their electric powerplant control units developed with them in the Douglas A-1H. North American A-1H, Convair X-17Y and Allison Turbofan and brought it to Washington for reliability demonstration to Navy and Air Force officials. Aeroproducts states that while certain control difficulties were encountered initially, most delays experienced in recent turbo-prop flights are attributable to other causes.

►Navy has completed negotiations with Air Force for loan of a North American T-28 trainer under contract for special flight purposes.

by John Chittenden (C) and Dr. Chief Executive Officer. Brown's work later. Since then he was the president's personal secretary. In the case of Thomas Brown, the letter did not have to be in his hands to be read.

Chittenden's letter, dated December 22, 1990, did not take into account the fact that the president's personal secretary was not in the office at the time of the letter's receipt. Chittenden's letter was not in the office at the time of the letter's receipt.

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Foreign Procurement Plans Readied

Ambassador William H. Draper, U.S. representative in Europe, announced last week that the Secretary General of the North Atlantic Council and its international staff would prepare "specific recommendations" for the coordinated production of aircraft in Europe to help meet NATO requirements.

The statement, issued through the Department of Defense, followed a previous announcement from NATO Secretary General Lord Avon, implying that U.S. aircraft procurement in that area is imminent.

Draper stated, "The details by the U.S. government on the use of procurement funds for the purchase of aircraft in European NATO countries will be made to the light of NATO (North Atlantic Council) recommendations, but the willingness and ability of other NATO governments to participate, with their own funds, in the NATO aircraft procurement will be a major factor in U.S. determination to proceed."

In an effort to satisfy Department of Defense requirements over the procurement of aircraft, Draper last week said that the NATO Secretary General would prepare "specific recommendations" for the coordinated production of aircraft in Europe to help meet NATO requirements.

Draper added, "In selecting the types and quantities of aircraft, the interests of the United States government in increasing its own defense aircraft industry will be carefully considered, along with the need for developing a viable aircraft production in Europe."

Top defense officials had informed American officials that the original NATO European release that any immediate plan to purchase European aircraft was a "red herring" and "completely untrue." In fact, NATO officials had already announced that the procurement of aircraft would be only at the end of a specific program which might be undertaken in the future.

New Step to Off-Shore Buying

Appointment of AMC procurement chief to NATO could signal immediate action on foreign plane purchases.

By William Kogler

Defense, D—Appointment of Brig. Gen. Philip W. Smith, now chief of the Procurement Division of the Air Materiel Command, to the post of Director of Procurement for the North Atlantic Council is likely to be a significant step in the procurement of aircraft in Europe.

For many months, while Smith was getting his assignments together, the Air Materiel Command has been working on the procurement of aircraft in Europe. Smith's appointment to the post of Director of Procurement for the North Atlantic Council is likely to be a significant step in the procurement of aircraft in Europe.

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independent and for their own interests, it was understandable that the two big air war long, used to be a common theme.

In the end of June, Smith had accepted the NATO Secretary General's offer of a contract to be increased by \$100 million. Smith's offer was based on the fact that the NATO Secretary General had accepted the NATO Secretary General's offer of a contract to be increased by \$100 million.

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GEORGE E. THOMPSON might be light jet with a 170 per cent jet fuel tank.

Ride Over Korea

- Jet tour gives first-hand look at the battlefields.
- UN works in the open but enemy stays concealed.

By George E. Chittenden

Remembrance Day, 1945—1990. We look at the first time the first time in a Lockheed C-130 jet.

Looking off from this low-altitude jet, the first time in a Lockheed C-130 jet. The first time in a Lockheed C-130 jet. The first time in a Lockheed C-130 jet.



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Central Europe will use Europa-built planes of types not built in the U.S.).

The overriding reason for the all-shore procurement program is logistics. It takes too long to ship to Europe any type of equipment and spare parts that might be needed in a hurry in case of armed action and shipping speed would be severe. For example, Allison engines on the F-4s being used by USAF, the French, Belgian and Dutch forces at present are situated in the U.S. for overhaul. There is no provision for manufacturing replacement parts in Europe, and the same is true of the F-4's itself.

Accordingly, AMEC (through Scudley's engineering), Allison and Republic have been working out a series of contracts with two Italian firms. Fiat will build Allison engine spares under license, but at the time under an AMEC contract. Fiat will not be an Allison subcontractor because Allison does not want to be in the position of giving work to foreign firms that might be performed in the U.S. Republic's deal with Fiat concerns its engine, more electronic and at an stage in the negotiations called for weekly payments. Thereafter, the Italian firms are to do final manufacturing complete assembly and engine overhaul. It is considered unlikely that Fiat will.

► **Other House-Other** high-priority items for Allied Air Forces in Central Europe are anti-aircraft, test equipment, trucks and C-47 and C-54 spare parts. All of these can be made there. It is expected these generally will be changed because all the savings in shipping charges. All systems are placed by replacement, under the same negotiation procedure employed at AMEC headquarters here in Dayton. There is no intention to place development contracts with European firms.

The final shore-to-shore business is expected to go to France and Italy. German industry will be used in such as possible. But there are two other items to bring German plants. Until the recently signed agreements between the German republics and the West are settled, German plants are forbidden to produce armaments or engine parts. More pertinent, the *Forces* "banish" items of AMEC has to remember strategic considerations.

No long lead-time items will be bought in Germany for the single reason that security of Western Germany sometimes is a day-to-day in week-to-week effort. The same concern with against non-heavy construction in the Netherlands, Belgium and eastern France.

An Air Force program in Europe finally allows they cannot distribute exactly what is the right time. It all depends upon what the plans must be safe from bombs, fighters, ground troops

Hughes Flying Boat To Get New Engines

Hughes Aircraft Co. will receive eight new Pratt & Whitney R4160-A engines for the quick being lost from the Navy through the Reconstruction Finance Corp., the company disclosed last week.

Hughes officials declared that the 164,000 lb. flying boat definitely will be flown in case as the new engines have been installed and tested. However, they said that these installations and tests will delay launching and flight tests until late this year. P&W officials said that another extension of time to Dec. 1 had been granted to the company at which time the plane must be launched.

Under terms of the new engine contract, Hughes Aircraft Co. has agreed to KFC, which in turn will furnish the new ones through Navy Modification (unpublished) in the H-46B to include new intake valve and intake seating, intake valve lock ring, new intake pipes and couplings, new carburetor pressure intake, and/or of manifold pipes with increased oil flow, installed exhaust support cage, cast nut lockwash in main 65 pass, propeller thrust nut thrust stanchion, streamlined propeller all transfer bearings.

The flying boat, designated H-46, is powered by eight Pratt & Whitney Wasp Major engines developing 3,000 hp each. Weighing in 538 ft 6 in. hull length, 218 ft 6 in. hull width, hull bottom to top of vertical fin, 79 ft 11 in. Performance specifications call for a cruising speed of 175 mph, a top speed of 210 mph and a cruising range of 3,500 mi.

House Plans Hearing On Kaiser Contracts

House Armed Services Investigative Committee, headed by Rep. Edward Brooke, plans to open hearings on alleged misuse of cargo plane contracts in industrialized Japan. The first of August after the congressional adjournment and the political conventions.

Pittsburgh Ensign and Airplane Corporation protested the letting of a C-119 contract to Kaiser-Fraser Corp., on the contention that Fairchild developed the plane and should be permitted to handle the production. Air Force also has contracted with Kaiser Aircraft Co. for production of the C-123, which has been criticized as a successor to the C-119. Kaiser has a 49% ownership of stock in the Kaiser company.

Meanwhile, Kaiser's entanglements with Rep. Alvin O'Konski are taken

lightly on Capitol Hill. This is what happened.

► **Alvin O'Konski's** May 21 face speech disowning Kaiser, highly favored with invoice, Kaiser rushed into conference with the congressmen.

► **The outcome:** An apology by O'Konski for not checking facts before publishing them. O'Konski agreed to give equal publicity to Kaiser's rebuttal.

► **In issuing the 45-page rebuttal to the press,** the Kaiser organization acknowledged it with a statement entitled "You're the fellow of O'Konski." The statement quoted O'Konski as being "completely satisfied" after reading the rebuttal that it "completely refutes all the charges I made."

► **According to the Kaiser organization,** O'Konski agreed to make the statement on presenting the Kaiser rebuttal in the House floor—otherwise they wouldn't have said the statement.

► **But on June 17, the release date for the Kaiser rebuttal and the purported O'Konski statement,** the congressman couldn't be located.

► **Looking for Rep. Frank Marshall** presented both the rebuttal and the O'Konski statement on the House floor.

► **O'Konski promptly showed up in Washington** area, protested that he hadn't seen the statement.

► **New day, Kaiser responded,** "Congress O'Konski definitely wrote a new release... instructing false charges which the congressman actually made against the Kaiser company and some of their executives." Any statement by Congress O'Konski to the contrary is just an untrue lie because his original release was changed.

Transport Interests List Lobby Expenses

Expense reports for the first quarter of this year filed with the House and Senate under the Congressional Lobby Act by various and transport organizations include the following, showing legislative activities for the three months:

- Aircraft Industries: Am. \$4,705
- Am. of American Railroads \$73,931
- J. Carter Scott, Am. of American Railroads: \$147
- Robert M. Drysdale, Federation for Railway Progress (legislative group from AAR): \$915
- E. G. Tipton, Air Transport Assn.: \$15
- Vernon A. Johnson, Lockheed Aircraft Corp.: \$594
- Harold Meier, Glenside L. Martin Co.: \$423
- Martin Peterson, U.S. Airlines: \$145
- Wm. Weighs, Aeronautical Training Society: \$11
- Am. Inc. no expenditure reported



technical bulletin

New Motor

with variable speed range
fulfills inverse
requirement

- EMCO has designed and built a new motor with a maximum operating speed of 5,500 rpm and a maximum of 15,000 rpm. Ordinarily such a motor would carry its heaviest load at low speed... a light load at high speed. This motor built to an inverse requirement runs at low speed under a small load (25 watts at 5,500 rpm) and at high speed under high load (250 watts at 15,000 rpm). Weighs 100 lbs. and operating at 240 volts, this motor performs and is continuous duty with a mean of cooling air.

- The problem was to convert the field and at the same time increase speed without the undue stability loss which normally occurs with this structure. EMCO's patent this invention, built universal drive to design and build for highly specialized requirements and on this problem, and make a highly constructed, smooth application practical which before had not been possible.

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In the aircraft industry, Cherry Rivets are standard in many plants for a multitude of hard-to-reach

applications. Production managers know they afford a quick, permanent method of fastening in final assembly and for truck riveting as well.

From aircraft, the use of Cherry Rivets has spread to many other industries. For example, they are ideal for fastening metal sheets to frames without marring area porcelain enamel surfaces. That is one reason why they are used extensively in re-manufacturing waste air fans, auto-condensers, metal cabinets, signs, refrigerators and ranges.

Cherry Rivets are one of the more than 10,000 types of special and standard devices produced by Townsend Company for fastening metal, plastic, wood, glass and fabric together consistently. This wide selection of fasteners is one reason why Townsend sales engineers are summoned in recommending the best fastener for a specific use. For information on how to improve product appearance—reduce assembly time and costs, write your nearest Townsend office today.



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PRODUCTION ENGINEERING

Cost & Weight Analysis of Titanium Aircraft Engine Parts

Part	Material	Approx. Wt. Finished Part, Lb.	Approx. Percent Wt. to Finish Wt., Ratio	Approx. Cost of Finished Part	Approx. Wt. Savings from Use of Ti per Part & Per Eng.	Approx. Cost of Weight Savings/Lb.
Propeller shaft	AMS 6412 Titanium alloy	22.0 32.0	3.0	\$150.00 1,150.00	21 lb.	\$91.00
Crankshaft flange	AMS 6415 Titanium alloy	40.0 27.0	5.0	120.00 1,420.00	18 lb.	73.00
Crankshaft center	AMS 6416 Titanium alloy	61.0 37.0	2.5	160.00 1,000.00	24 lb.	90.00
Crankshaft rear	AMS 6415 Titanium alloy	25.0 27.0	3.0	70.00 650.00	13 lb.	41.00
Articulated rod	AMS 6412 Titanium alloy	3.0 2.0	3.5	15.00 10.00	1 lb./part 10 lb./eng.	22.00
Washer rod	AMS 6412 Titanium alloy	17.0 10.0	6.0	37.00 700.00	7 lb.	35.00
Rock arm	AMS 6122 Titanium alloy	1.0 0.5	2.0	5.00 30.00	4 lb./part 14 lb./eng.	50.00
Turbine support	AMS 6122 Titanium alloy	3.0 2.0	8.0	50.00 240.00	1 lb./part 3 lb./eng.	104.00
A typical compressor rotor disk	AMS 6442 or Ti-6Al-4V	25.0 24.0	5.0	90.00 75.00	13 lb./part 10 lb./eng.	50.00
A typical compressor rotor blade	AMS 6412/AMS 6416 Titanium alloy	0.06 0.09	2.0	3.00 6.00	50 lb/part 60 lb./eng.	175.00
A typical compressor rotor blade	AMS 6412/AMS 6416 Titanium alloy	0.10 0.26	6.0	5.00 15.00	54 lb/part 15 lb./eng.	236.00

The Cost of Titanium-Alloy Advantages

While metal offers great weight economy over steel in engines, with present methods the price is high.

The aircraft engine—both piston and jet—or one application where titanium and its alloys indicate considerable advantages over other metals.

There are many design and production problems involved, however, and much to be learned on where and how titanium's great weight-saving, high strength (which can be a replacement scheme). A discussion of most of the design we have learned about working titanium appeared in *Aircraft World*, June 2, p. 48.

► **New Uses Sought**—New research and production techniques are being pushed to establish titanium use for the jet and its alloys.

As an example of experimentation that is going on in the engine field was reported by H. H. Hunsak, manager of the Engineering Dept. Materials and Process Research Division at Wright

Aeronautical, in a paper, "Application of Titanium to Aircraft Engines," at the recent National Aeronautics Meeting of the Society of Automotive Engineers, in New York.

Discussing piston-engine applications, Hunsak says that titanium's advantages from the use of titanium should come from substitution of alloys equal in strength to the steel alloys now used in the crankshaft and connecting rods. This will mean a saving of about 40% in deadweight, and there is an additional substantial saving because weight of counterweights will be less.

► **Piston Flare Uses**—Referring to the Wright Turbo Compound engine, Hunsak says the crankshaft is an assembly of three piston-flare, center and rear. Front and rear parts carry the main weights and are clamped in the center section with a bushing joint.

Many rod bearing journals and with fashion bearing support surfaces in the crank section are reinforced for added structural strength, joining and drilling. AMS 6411 (SAE 4240) alloy steel heat-treated to 215-225 Brinell Hardness Number is used for all main shaft parts except crankshaft center, which is AMS 6352 (SAE 5115) carburizing steel with 209-375 Brinell core hardness and minimum hardness of Rockwell C 50 on carburized surface.

After the titanium alloy has been treated to adequate resistance for the propeller shaft and the crankshaft rods, from standpoint of compressive loads, strength and low operating temperatures involved, are Ti-6Al-4V, Ti-6Al-2Zr and Ti-7Al.

Potential weight saving through substitution for the same shafting steel is up to about 77 lb. of deadweight, but 63 lb. these considerations must be made.

► **Case the weldments**—Inspection of titanium toward cold-welding (vacuum



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FIG. 1. Notching sharply lowers fatigue strength ratio of T-175A aluminum alloy, which is polished first as sheet steel is for alloy steel.



FIG. 2. Shear stress lowers fatigue resistance of 7075-T6 aluminum alloy, but permits fatigue strength of alloy sheet used in connecting rods.

(having) be overcome satisfactorily in splice joints and clamp joints.

How will its low modulus of elasticity affect external frequencies and deflection of the shaft assembly?

While it can be surface-hardened by treatments such as anodizing and case-hardening, will this give adequate corrosion and wear-shaft properties to the bronze?

Hanauk says that the first two items probably can best be resolved by full-scale engine tests. Research on the third item is underway, but on the present absence of sufficient data, use of aluminum for the crankshaft center probably should be deferred.

For the same reason, titanium alloys are not being considered for a large number of gears which might involve very large total weight savings. With

grass, he says, there is also the added custom whether surface hardening treatments for titanium would offer equal benefits from improved fatigue strength at the tooth roots as for carburized or nitrided steels.

Notch Sensitivity—Substitution of T-175A in connecting rods of an H-1750 engine would give a weight saving of about 5 lb. based on present steel parts and counterweight rings. In a T-175A articulated rod, a typical fatigue failure occurred after 10,175,000 cycles under loads equivalent to takeoff conditions. Failure was initiated by a scratch less than .001 in. deep in the rod, caused by insertion of the broken bushing in the knuckle pin rod.

Because standard steel rods are able to show more before exhibiting as up to 200% of simulated takeoff condi-

When radar intelligence reports approaching enemy bombers, the carrier-based Douglas Skyray streaks up to intercept.



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A new concept in fighter planes, the Douglas F4D Skyray—when operating from carriers—will let fleet units move deep into enemy waters, protected against sudden attack. When shipboard radar shows enemy bombers approaching, the Douglas Skyray streaks up and hovers—to

keep them from hitting vital targets. On spotting the enemy, Skyray strikes down at terrific speed—splitting a stream of bullets, and rockets. Yet, despite its tremendous speed, Skyray's reflexed swept-back wings can bring it slow, for easier landings on aircraft carriers.

The outstanding performance characteristics of the F4D Skyray are another example of Douglas leadership in the many phases of aviation. Designing airplanes for quantity production to fly farther and faster with bigger payloads is a basic concept with Douglas.



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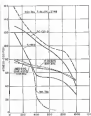


FIG 3. Offset yield strength of titanium alloys compares favorably with alloy steels. High strength aluminum alloys is inadequate beyond 350°.

how, Harnad, says it would appear impossible to question the match superiority of the titanium alloy used.

Fig. 3 shows that while Ti-6Al-4V has a longer strength-to-weight ratio than steel the same as for the alloy steel used in connecting rods when in a constant, polished state, it is only about 1/3 in good when tested in the standard condition.

The work at Wright Aero has indicated that this extreme characteristic is not necessarily true for all alloys. This fatigue strength is increased by shot peening, but fatigue tests on shot-peened titanium so far have indicated a detrimental effect (Fig. 2).

• **Other Comparisons.** Along with the considerable center section and cast head-end gear, another major steel engine part which may not be readily adaptable to the use of titanium alloys is the compressor variable.

This assembly could provide a weight saving of about 70 lb if made from titanium alloys, but here, says Harnad, the low modulus of titanium would require excessive deflection and cause an engine problem of rubbing under cylinder droops and between the three sections, as well as the potentiality of fatigue troubles with expansion, stress and cylinder droops.

Weight savings for these compressors might well be obtained if space considerations permitted isolated sections of titanium to improve strength.

Other smaller parts such as the Ti-

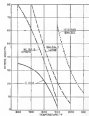


FIG 4. Comparison of three titanium alloys to produce total plate stress of 8,500 in 1,000 lb. vs. temperature for a heat-treated titanium alloy and steel Ti alloys.

13RA, rocker arms, push rods and valve nose support must be heavily reinforced by full-scale tests to determine suitability when made from titanium.

But there is no obvious reason why they should not function successfully. A potential weight saving of about 20 lb could be realized for these small parts.

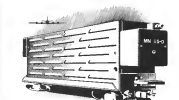
• **Fig. Use in Jet.** Harnad claims that there is even greater opportunity for weight saving in a turbojet or turbo-prop engine through substitution of titanium. This is because the compressor section, which accounts for a large portion of the total engine weight, has a substantial part of that weight coming about the shaft. Under proper design conditions, for example, a reduction of 1 lb in compressor rotor blades may save up to 5 lb in the supporting structure. More important, he says, the compressor section primarily operates at temperatures within the scope of titanium.

• **Strength Data.** In compressor rotor data, Harnad says that potential increase in yield strength vs. temperature is the most important general design criterion for determining the suitability of titanium alloys for these parts.

While investigators note through the compressor rotor with different degrees due to compressor rotor variations, a range of possible part temperatures from below zero to as high as 1,000°F is of general interest.

Fig. 3 compares the 0.2% offset yield strength of three titanium alloys with two alloy steels, heat treated to properties typical of steel disks, and one high-strength aluminum alloy with good heat resistance. All properties have been adapted to the density of titanium.

On the basis of short-term tests



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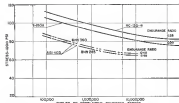


FIG. 5. R. & R. Mean rotating beam fatigue curves comparing typical compressor blades with two titanium alloys in the polished condition.



FIG. 6. R. & R. Mean rotating beam notch fatigue curves for the titanium alloys in Fig. 5 (strength, V notch, .005/.006" root radius).

strength, the titanium alloys compare favorably with the alloy steels. The aluminum alloy becomes inadequate by about 150°F.

► **Creep Considerations.**—But, Blank says that short time strength comparisons give an unduly favorable picture of titanium alloy properties, since unlike steel, and even at room temperature, these alloys show relatively high creep rates for stresses as high as the 0.2% offset yield level. Fig. 6 indicates the relationship between the time-tension alloys noted in Fig. 5 with respect to the time to produce 0.5% creep at 1,000 lb. at temperatures from 800°F through 1,000°F.

In contrast to alloy steels which can be used on the basis of short-time tensile properties through at least 730°F, none of the titanium alloys shows signs of offering suitable creep strength for compressor disks much beyond 700°F. Extra time, some of the weight advantage over steel may have to be sacrificed, depending upon the efficiency of the original design of the steel disks and the maximum section size to which

it may be modified under practical conditions.

In spite of less than full advantage

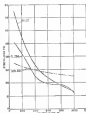


FIG. 7. Other yield strength vs. temperature for two grades of commercially pure titanium and 121 stainless steel.

from substitution of titanium alloys for steel, it has been found possible in a typical compressor of advanced type to save 12% to 20% lower rotor disk stress, provided that titanium is also used to replace steel in rotor blades, thus lowering disk stresses appreciably.

► **Blade Potential.**—Considering the use of titanium alloys for compressor blades, fatigue characteristics play a dominating role because of concern over the effects of blade vibration, Blank says.

But for compressor disks, creep strength is also of importance, due to bending loads on rotor blades and both bending and centrifugal loads on rotor blades.

It is considered reasonable to estimate that about 700,730°F as a limiting temperature for the use of titanium alloy compressor blades, based on creep characteristics, even though blade length, and generally blade stresses, diminish toward the high temperature end of the compressor, he says.

► **Blade Notches.**—As with connecting rods for reciprocating engines, the apparent tendency toward notch sensitivity of titanium alloys as compared to alloy steel points up the necessity for considerable care in producing titanium alloy blades with good surface finish.

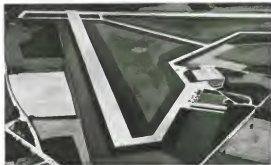
Well polished blades should provide good fatigue strength as noted in Fig. 5, where higher curves for two titanium alloys are compared with a typical stainless steel used in compressor blades. Fig. 6 indicates notch sensitivity for both of the titanium alloys is greater than for the stainless steel, although less than for the Ti-15V4 generally discarded.

Blank points out that the apparently detrimental effects of corner round-off (not passing practice on titanium) may also imply that titanium blades may be overly sensitive to damage from nicks and scratches in bend areas at engine operation.

But on the plus side, and in addition to their good weight/strength ratio and excellent corrosion resistance, titanium alloys may actually be subjected to lower fatigue stresses than steel because of their lower elastic modulus, he claims. While amplitude of vibration would increase over that of steel for the same exciting conditions, it probably would not reach a point where bending stresses would be equal to those for steel blades.

► **Power Metal Applications.**—Commercial pure titanium may find such uses as turbojet and turbo-prop engines as combustion chamber or compressor housings, bearing supports and heat shields. Interiors of hot short metal

Compared with carbon steel, titanium is lighter, also non-distorting,



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FORGED and finished machined rocker arm made from T-1504 titanium alloy



COMPRESSOR rotor disk made from L245 titanium alloy forging

and has no need for a protective coating. Through 600-700F, it may usually be substituted for other carbon steel or stainless steel as not strong in weight.

In Fig. 7 two types of continuously press elements are compared to 321 stainless with respect to yield strength through 1,000F. Again, titanium says, "strong properties, even at low temperatures, may control the design stress levels for titanium, and in some cases where sheet metal structures are designed primarily for stiffness, the low modulus of titanium may be a further limitation in full weight savings.

Referring to a large turbine produced from 010 in. 1-1/2 in. he says that the electronic and successful use of spot and fusion welding, as well as relatively severe bending, illustrate that, unlike casting titanium alloys, the conventional cast grade are usually worked.

Fusion welding has also been shown successful on a commercial scale, so that there is no technical obstacle to the fabrication of potential sheet metal engine parts which typically require welding of formed sheet to integrally forged or solid and flash welded flange rings. P-Cast Fusion—The day is long past



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THE WHIRLING FLAME

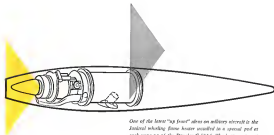
1



When you "roll up" a flame as is done in Janitrol® "whirling flame" heaters, it's easy to see how space is saved...but, equally important is the basic improvement in heat transfer efficiency which makes this a major engineering development.

On the inside wall of a combustion chamber is an insurable layer of gas which retards heat flow from the flame to the wall itself. The thickness of the insulating air film is substantially reduced by the "whirling action" of the Janitrol whirling flame. So...this principle not only criss up approximately 10 times less of flame area a heater only 2 feet long (model 8-200), it also increases the rate of heat transfer more than 4 to 5 times that obtainable by conventional design methods.

This fundamental development in 1942 led to the first truly successful aircraft combustion heater, and broadened the acceptance of the same "whirl" in heating and combustion for aircraft applications.



One of the latest "big four" items on military aircraft is the Janitrol whirling flame heater installed in a special pod at each wing tip of the Douglas C-124B. The heater puts out 600,000 Btu/hour for wing anti-icing. Two more 600,000 Btu heaters are used for emergency anti-icing and a 300,000 Btu unit is used for cockpit comfort...a total of 2.5 million Btu. At the same time, aircraft performance is improved and the end plate effect of pods raises service ceiling of the airplane 1500 feet. When a new heating or combustion system is in the idea stage, it's time to call your Janitrol representative.

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INTERCEPTION TRAINING of jet pilots will be carried out against Goodyear Aircraft Corp.'s new target, shown here in artist's conception of preliminary design.

New 'Punching Bag' for Jet Pilots

Preliminary design of a new tow target for training jet pilots has been completed by the Goodyear Aircraft Corp. for the Air Force as part of a development contract.

Goodyear's program calls for a one-year period in which to design and develop the target and build and test several prototypes.

A current trend has been toward smaller towed targets of all-weather jet aircraft pilots in interception techniques at high altitudes and high velocities.

Control in the target will come either by automatic sequence or by direct control

from the towing airplane. Detonate by remote target and target can be as much as two miles, and the target may be towed in an offset position to one side of the towing craft.

For landing, the tow cable releases automatically when the target touches the ground. Shocks are mounted at the lower tip of the vertical fin and on the forward fuselage belly. Release of the tow cable also blows a ring parachute from the tail of the target.

Development of the target will be done by the acquisition department at Goodyear in cooperation with the Army and the United States Office of Equipment Laboratory, Wright Air Development Center, USAF.

new designs. And we need a design team with the ability to integrate all these and backen with enough guts to get the design pushed through.

The most could be excellent liaison aircraft, they could compete with the first service missiles and stand out as offensive air power until the guided weapons come into its own.

One interesting difference between British and American aircraft design practices is in the placing of responsibility for the design integrity.

The British have what is called the Design Approval Scheme. Before the airplane is built, the Ministry of Supply, which lets the contracts, must be satisfied with the qualifications and experience of the chief designer and his staff and must approve of the test facilities and other development aids at his disposal.

Before the airplane flies, the designer signs a certificate which says that the requirements of the specifications have been met. That certificate also defines the flight conditions of the airplane. And that design responsibility for the airplane from start to flight also covers much of the equipment—furnished by other firms—used in the craft.

Thompson Joins in Work-School Deal

Thompson Products, Inc.—Case Institute of Technology—Thompson has entered an understanding of new scholarships to cover tuition and even test time plant work.

Thompson's full tuition payments will be \$100 per year and provide necessary work in the Thompson laboratory at current wage rates. Case sees the Thompson action as a big asset for the student financially, experientially and as an encouragement to meet industry's engineering needs. Students actually will get broad management training via company educational material which they will receive regularly.

Upon graduation, the student would be considered for airport employment with the company, but he would not be committed to it, nor will Thompson be obligated to hire him.

When the program is in full operation, scholarships will cover four students, three graduates, one sophomore and one freshman.

Women will be chosen in June, summer work will begin at once and two grants will start with the fall term. Selection will be on the basis of character, personality, school record, and interest in summer work experience and a possible career with Thompson Products.



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31

The New AC 171



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Following a record-breaking contract from the Armed Forces for the new AC-171, this great new Aircraft Plug has been approved for the engines of the Constellation.

Utmost reliability has been achieved in the AC-171 through many engineering and structural features, among which is the exclusive one-piece insulator. This insulator prevents flashover from corona points to shell. It also facilitates clearing the terminal well, because it eliminates the dirt trap between the core insulator and the shielding barrel insulator.



AC SPARK PLUG DIVISION
GENERAL MOTORS CORPORATION

OFF-THE-SHELF wire amplifiers like this are now available.

Electronic circuit standardization is emphasized, Quinn points to the vacuum tube stock. In the early days, many radio manufacturers designed and produced their own special tubes. Today, no electronic circuit engineer would develop his own special vacuum tubes for every new circuit he designs. Instead, he turns to a tube manual and selects the best standard tube which is available.

Use of standardized tubes may occasionally compromise circuit design, but this is a small penalty compared to the many benefits for both the designer and the equipment user.

Would standardized handbooks, circuit style copybooks and advances in circuit design? Quinn doesn't think so. He says the handbooks, basic circuits should be as dynamic and changing as today's standardized vacuum tubes. From time to time new basic circuits would displace older ones. Additional circuits would be added occasionally to meet new circuit design needs.

Improved Reliability.—Quinn approving a handbook here circuit for production, it would get the full test and "debugging" treatment to prove its design and its construction. This would negate the major danger of poor circuits, and basic unit construction to meet various environmental conditions.

More important, it would assure the designer that new electronic systems are made up largely of proven, completely debugged electronic circuits. As it is today, Quinn says, before a new military equipment is completely debugged, it is frequently obsolete.

Quinn thinks that most basic units would be single-stage circuits. However, investigation might show the desirability of a few multi-stage basic units such as RF stages (intermediate frequency amplifiers).

Single-stage circuits are preferred by

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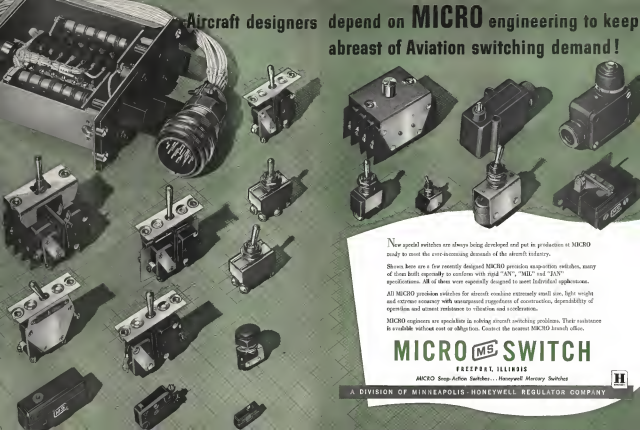


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ern cities and sea and mountain resorts to offer every cultural and recreational advantage.

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Design, development and test engineers with aircraft and aerospace backgrounds will find full opportunity in Hamilton Standard because of the newness of the jet equipment field itself. The company's extensive research staff of your field, yet extremely high caliber men—its policy of recognizing talent and ability—its practice of quickly engaging responsibility—and its continuous habit of promoting from within—may well be the conditions you have to mind for a satisfying life as an engineer.

Specify kind your answer to the Engineering Representative, Personnel Department, at the address listed below. It will be held in strictest confidence.

HAMILTON STANDARD

DIVISION OF UNITED AIRCRAFT CORPORATION
WINDSOR LOCKS, CONN.

cases they can be used in a wide variety of electronic systems. In addition, the military can track pretty sweeping leads. Basic work instead of going to the expense and trouble of repairing them.

► **Functional Assemblies**—The system designers would package his circuit basic units, as what Quince calls "functional assemblies," several of which will make up the complex radar, autopilot, fire control or other system. The only limit on physical size is that the functional assembly be small enough to be easily handled by one man.

As an example, Quince says that a radio receiver might be broken down into the following functional assemblies: (1) RF section, local oscillator and mixer; (2) intermediate frequency amplifier; (3) audio detector and audio amplifier; and (4) power supply. A different functional breakdown would obviously be needed for radio equipment.

► **Fault Finding**—When an electronic circuit fails, it should be capable of being put back in operation quickly. Under the proposed fault-finding program, that means passing the link down to one of several functional assemblies and isolating the defective one.

To tell whether a functional assembly is faulty, the designer would establish one or more tests which would be performed indicating whether the assembly is performing satisfactorily. (This must be done anyway in manufacturing test procedures.)

The test will call for introducing an appropriate input voltage and measure, e.g., the magnitude, phase, frequency, or other characteristics of the functional assembly output. Where the output must be checked on a radio-frequency oscilloscope, Quince would provide templates to fit on the oscilloscope tube to show satisfactory limits. This criterion of functional assembly performance Quince calls the "index characteristic."

Fault isolating test equipment would be designed to check index characteristics of functional assemblies. The assemblies themselves would be designed to receive the fault isolating test signals and only connected for interest to input and output terminals.

In this way, a short series of "go, no go" tests could quickly pinpoint the faulty "assembly" which needs to be repaired.

► **Less Skill Required**—With functional assemblies construction and fault-finding equipment, Quince is confident that men with little training compared to the highly trained technicians now required, could work through the more complex systems. The same man could quickly make the needed repairs merely by replacing the faulty assembly with one off the shelf.

—The Navy, Adaptive functional as-

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Outstanding accuracy that never "wears out!" You get this combined with small size, light weight, and negligible rate-of-drift error. In Vapor sensory tube thermostats.

Like medical thermometers, accuracy constant and does not vary. It is unaffected by altitude, vibration, dirt, dust, or moisture. Controls are sealed—they're tamper proof, can't see or burn—and there's nothing to put or remove. Vapor sensory-tube thermostats retain their accuracy, whether in use or in storage.

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be returned to sender's depot.

► **Cost Timeliness**—The use of stand-alone process circuits could greatly cut the time now required to develop and design new electronic systems. It would not mean that the designer could sit down with the circuit board, look at it in a few moments, come up with the design of a new radar. He would have some original circuit development, where standard circuits don't fit. In addition, he might need to design some custom circuits or act wisely to adapt standard circuits.

Once the system were tentatively laid out, the designer could quickly construct the function "breadboard" to prove system performance. The laboratory technician would carry standard circuit board units, much as it now carries standard vacuum tubes, resistors, capacitors, etc.

With the breadboard concept outlined, the major saving in design and debugging time would be made. The production design phase of laying out every resistor, capacitor, vacuum tube, transistor, etc., could largely elude itself. These units would be laid out on the functional assembly together with any special circuitry which might be required.

Even though the individual base units were known to meet various circuit conditions in individual components, a manufacturer would probably want to build a production prototype to check for possible hot spots or other conditions resulting from the particular layout of the base units.

With the design ready for production, lengthy lead time could be cut drastically. The base units would be commercially available much as tubes, capacitors, etc., are today. When these raw materials were received, the major part of the system wiring would already be complete and in place within the chassis.

► **Opening For Small Industry**—The aviation and military electronics markets are a tough one for the small tube or electronic manufacturer to enter. His engineering staff, of perhaps a dozen engineers, is quite adequate for his commercial business. But it is too small to undertake a major development like a radar set, weapons pilot, or fire control system.

As their systems have grown more complex, the military has been forced to let outsiders for complete system rather than for individual components. Otherwise the problem of integrating the components into a working system becomes too difficult. The result is that the small electronics manufacturer's facilities are used only partially or not at all.

However, any one or more of the standardized circuit board units would be an ideal assignment for a small man-

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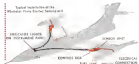


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This lightweight optical device instantly detects the presence (or absence) of liquid in hose, tube or pipe. It uses no moving parts, places no obstruction in the passage.

Some important safety advantages...it gives instant low fuel level warning...indicates completion of fuel transfer...assures correct fuel system operation...operates valves or pumps in automatic liquid system. With slight modification it indicates amount of holding in fuel systems.

The Whittaker photo-electric sensing system is an ingenious adaptation of the "magic eye." It detects a change in the receipt or the exact instant that its light path is diverted by the presence or absence of liquid in the passage, or by the varying ratio of liquid and vapor. It operates with any clear or translucent liquid under pressures from 0 to 300 PSI.



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EQUIPMENT



USAF Pilots in Korea 'Love That F-86'

- Versatility, ruggedness, high utilization praised.
- Intricate systems stand up well in combat.

By George L. Christian

Fighter ace, USAF, Korea—Here there is no hull in the tempo of war.

Here, and at two other fighter bases at the front, rated by the service, there is an increasing movement of men enthusiastically donating donations to the enemy. Most come back, some do not.

Assured the Clock-France came to end fighters, mostly American jets but occasionally British Meteor and F-105 too, are being hurled off the runway to perform a variety of missions over enemy territory.

Some photograph. Our side must be kept up to the ground on the deployment of Communist concentrations, supplies, strength.

Others go in. On the deck, to drop bombs on enemy installations, supplies, 300 and 1,000 pounds. A total dive at altitude, and no rocketing, usually, is accompanied by low level strafing.

Over the mountains and fighter bomber flights, F-86s give protection over. If the MIGs come out, that's the F-86 department.

After dark the wings of the jet are replaced by the roar of the reciprocating engine. B-28 climbing over to leave the foe. And an occasional jet



THE FLIGHT CHECK is made by ground crew of F-86 at behind-front maintenance base.

night intercept fighter bleeds into the sky, its silhouettes shining. These may night power are a relatively new addition to the Korean scene. On its around the clock basis, the jet gets little respite from the air.

Winged jets—One characteristic common to the three U.S. jets used extensively in Korea (F-86, F-84, F-80) is their ruggedness and ability to absorb maintenance, destructive battle damage.

The F-86 Sabre unquestionably is the outstanding combat jet in Korea today. Not only is it the only ship that can handle with the MIG on an even basis, but it is highly versatile

The plane is used as a bomber (carrying two 1,000 pounders), a strike, and rocket plane. An F-86 sports two canons in its nose for reconnaissance work.

Engine Report—And the jet engine is turning in a good record. One aircraft with over 50 operational hours had only one plane because of engine failure in a year's period.

Big Difference between Korea and Europe is that there are no clouds and no volcanic ash. "You get wet, but the pilot's forehead," is the way one GI technician put it.

The results turned in by the ground crew are impressive. One squadron of F-86s had 100% of its aircraft in com-

mission for five consecutive days, in spite of two planes that returned with battle damage. The same squadron kept 94% of its planes operational for a period of over six weeks. Squadron engineers often stress that they are, perhaps, unusually little maintenance trouble with the F-86, its systems are so rugged.

From the nose—Here are some illustrations made by engineers and maintenance personnel at F-86 combat bases.

• **Wing problems.** External wing bracing sometimes rises up upon release, slide down the leading edge of the wing back wing and back off the pilot boom. Pilots are landing on F-86 without an integral indicator is partly tricky business—they follow a timer they is if possible. Another problem is that, at high speed, the tanks provide too little balance at the trailing edge of the wing flap resulting in cockpit and pulled right.

There is also a report of a tank flying into the fuselage, ripping out a top section. Another smashed into the subfloor, shattering the whole assembly. Some tanks just fall in place.

• **Parasitic dampers.** One 95 squadron passed the pneumatic system as being "the only system on the aircraft that has been positively trouble-free since the plane was put into service." Yet at another base and more miles distant, engineers now did not like the pneumatic system. "If you have your air, you can't fix your gear—what they can fix is the fuel," one officer pointed out. He added that leaks in the system were not uncommon.

An added remark was that the para-metric system held the bolt in the engine position. Sudden changes of altitude and temperature could result in the bolt becoming frozen in the retracted position, making the gun inoperative. This is being changed to leave the bolt in the forward position where the gun battery can provide sufficient heat to keep bolts thawed and in working order. Pilots will be able to hold the bolt open manually to cool the gun. Bolts are also pulled back before landing to prevent inadvertent firing in case of a hard landing.

• **Power loss.** One of the biggest problems from the pilot's viewpoint is loss of engine rpm and power at altitude. Only recently to replace the fuel control unit. Loss of power is obviously serious when flying with a MIG whose good high-altitude performance pushes the F-86 to over 40,000 ft.

• **Target locked.** The F-106 control antenna, so instrumental in giving up pilots on edge over the MIG, was being damaged and malfunctioned at one F-86 base. Called present locked, it involves cooperation with from Sperry, ACI Studio, and North American Aviation, Beverly

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NEW AVIATION PRODUCTS

Inventor Devises An "Aircraft Horn"

Practically every means of locomotion has a horn to warn persons of its approach—except the aircraft. Now Charles Adler, Jr., New York inventor, inspired by accidents where disabled aircraft, making forced landings, have disoriented persons on the ground who were unaware of the low plane, has patented his general use a patent covering aircraft horns.

The device is designed to throw sound sufficiently forward and down from the plane to give groundlings time to take cover. It would have an easily recognized emergency signal. The design is covered by U. S. Patent 2,812, 075.



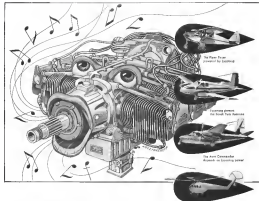
Baby Actuator

A new baby has been added to the family of General Electric actuators produced by the Pacific division of Bendix Aviation Corp.

It is a miniature actuator which can develop 100 lb. in torque at 90 deg./min. The unit weighs 1 1/2 oz., measures about 2x1x1 in. and is powered by 24 v. d.c. systems.

Small size and lightweight are attributed mainly to development by design of an entirely new concentric square split stator motor which gives high performance without the bulk and weight formerly required. Further simplification is attained by building the integral switch directly into the connector. The motor mounting face utilizes electrical connectors that automatically make contact as the motor is assembled to the gear case.

Pacific division of Bendix Aviation Corp., 11659 Sherman Way, N. Hollywood, Calif.



its "song" fills the air

The power that puts Piper, Beech, Aero Commander, Dornier, and many other planes into the air offers to American industry numerous other applications. For this is an *easy power*—practical, economical, dependable wherever and whenever it is used. More than this, it's the power of today, destined to be the power of the future.

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To power their planes with fine engines—a wide home-grown power—many famous American aircraft makers sell on Lycoming for precision production.

Tiny Hearing Aid Is Custom-Molded

Radios headphones have taken a long stroll in cardiovascular suits. Well? Not if they custom-molded earphones, specially fitted to the ear and much more sensitive than those made from any other material. A simple hearing aid device recently which can stay on without benefit of headphones and have one ear free at all times for cockpit chatter.

Part of that is to be approved by the Civil Aeronautics Administration as portable in a disaster, "hearing aid"

type headphones sold by Amphos Inc. A unit made by Hirsch Laboratories, Portland, Ore., was described in *Aerospace Week* May 26, p. 66.

Amphos models its response to a very impression of the user's ear, providing a tight, but comfortable fit. The phone stays in place regardless of movements of the head or plane, according to Ray Hirsch, the firm's director of sales, and an experienced pilot.

Development of the unit is the result of Hirsch's dissatisfaction with present sets, including some of the miniature ones, he says. Some of these, while having a small earphone, wasn't fitted to the ear and slipped out when he

shook his head, the developer says. The new Amphos has an volume control designed so that reception can't be inadvertently turned down below the hearing point. Also, the volume control can be raised and beyond if it fails in connecting worn directly to the earphone.

While early study is done in a hearing aid, the set is more rugged, according to Hirsch. It is supposed to be 12 times more sensitive than old types.

Amphos, Inc., Suite 309, Colman Bldg., Boston, Pa.



Pressurizing Kit

A pressurizing kit for aircraft radiators and other equipment has been placed on the market by the Ramco division of Lear, Inc.

The kit gives dry, oil-free air at elevated pressures by means of its own compressor and is designed to operate without interruption for long, unattended periods. No lubricant is used in the compressor. A type dehydrator or filter which can be changed in a few seconds helps insure that there are no breaks interrupting operation of the pressurizing kit.

The kit requires less than 4 cu. ft. of installation space, weighs 35 lb. Its level capacity is 1.0 cu. ft. of free air per minute.

Ramco division of Lear, Inc., Elgin, Ohio.

Airport Lights

Whitingshore engineers have come up with a redesigned light fixture for instrument runways that they claim is simpler, easier to adjust and maintain and lighter in weight than old-type ones.

The assembly, operating on three independent 6.6 amp.-watts circuits has a modern intensity light on top (the good weather light) and one of high capacity burning out of each end to throw a penetrating light through fog, haze and smoke.

Whitingshore Electric Corp., Pittsburgh 34, Pa.



Flexible Metal Throat Feeds Fire in the Sapphire

Here's the new Wright 365 (topright) Turbogrip engine—and the Titeflex metal hose throat through which it gets its fuel. Flow must be regular and unobstructed and the fuel line must be leakproof.

Titeflex's Flexible All-Metal Hose feeds the 365 jet engine. Titeflex has all the qualities essential to safety and efficient service. Its consolidated wall structure assures flexibility and freedom from the constant stretching and compression that take place in continuous solid-wall tubing. Its all-metal construction provides great strength and safe, faultless performance under critical pressure, vibration and temperature.

With years of outstanding service in the aviation industry, Titeflex today leads the aviation field in metal hose development. You'll find Titeflex preferred for such applications as flexible ducting conduits and ignition harness, all welded lines, flexible air, water and hydraulic connections. Titeflex Engineers and Designers have vast knowledge of Titeflex performance and its extensive possibilities. Original design work and problem solving are important parts of our business. Let us help you solve your connection problems. Write for literature.



Close up of Titeflex fuel injection line for the Wright 365. Tested for temperatures from -75° F. to +150° F. and for pressures up to 200 p.s.i.

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FINANCIAL

Common Stock Flotations in 1952

By Firm

Date of Offering	No. of Shares Offered	Offering Price	Current Price
Mar. 20, 1952	10,000	\$1.00	\$1.25
Apr. 1, 1952	10,000	\$1.00	\$1.25
Apr. 1, 1952	10,000	\$1.00	\$1.25
Apr. 1, 1952	10,000	\$1.00	\$1.25

1. As of June 1, 1952.

2. Based on the price of the stock.

3. Based on the price of the stock. The company has a total of 10,000 shares outstanding. The company has a total of 10,000 shares outstanding. The company has a total of 10,000 shares outstanding.

4. The company has a total of 10,000 shares outstanding.

Airline Financing Getting 'Sticky'

Public reaction to stock offerings this year has been disappointing, may make it hard to raise funds later.

Airline financing operations have been seriously handicapped by disappointing investment returns thus far this year. Of the five public stock offerings, only one, the Frontier offering, was successfully sold by the underwriters. The other four issues proved

"sticky," with the underwriters taking down in their own account and the public substantial percentages of the new stock offered.

Money talks—The air transport industry expects substantial capital funds to finance new aircraft and airports, increasing traffic demands. The re-equipment for new and additional air craft and airport facilities have not dulled the ability of most companies to finance their operations from their existing capital resources. As a result, in order to provide the necessary funds to purchase equipment being delivered most airlines have had to broaden their capital base.

In the financing accomplished thus far in 1952, funds were sought through the sale of additional equity. Thus far most possible alternative short-term bank loans to supplement capital requirements.

Equity financing was usually not constant during 1952 for the airlines, the only public offering being a convertible debenture issue marketed by NBC-Continental in the rear. The fact that the new stock was not successful, as it was sold at a discount after its offering and has remained there ever since.

The accompanying table reveals the record of 1952 airline equity financing. By almost exception, all issues are available below their original offering prices. It is an interesting coincidence that all five stock flotations came to market virtually at the same time.

Continental Truck-Continental Airlines had the first 1952 offering, marketing its issue on Mar. 5. The \$9,944 shares sold at \$9.95 per share to the

public, instead ran proceeds at slightly less than \$450,000 to the company. This was after underwriting commissions of \$1 per share and expenses of \$25,514. In addition, Continental succeeded its bank loan agreement to be able to borrow up to \$5,000,000. All these financial funds will be devoted to meet the financial requirements of the company's equipment purchase program, expected to involve aggregate expenditures of about \$7,000,000 before the end of 1953.

FWA & Hughes—Trans World Airlines' organizational statement became effective Feb. 28, 1952, but its financing was not completed until Mar. 16.

This flotation was accomplished through the offering of rights to stockholders. For each ten shares held stockholders had the privilege of sub-tracting to one additional share of \$21.57. This device enables the equity holders to protect their position against dilution and hopefully represents a source of recycling stockholders to provide the necessary additional capital. TWA financing was raised from a number of sources. The company was required by the terms of its amended loan agreement with the Equitable Life Assurance Society to raise an additional \$5 million in equity capital by the end of 1952. This was

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MODEL 855 (left) shows how heat can be measured in the laboratory. Model 855 (right) shows how heat can be measured in the plant.

STANDARD RANGES: Model 855 (left) shows how heat can be measured in the laboratory. Model 855 (right) shows how heat can be measured in the plant.

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subsequently deferred to May 31, 1952. The Hughes Tool Co., which owned 1,763,825 shares, or 74% of the total stock outstanding, agreed to purchase sufficient shares of additional stock to provide the airline with net proceeds after deducting expenses of the financing of at least \$5 million. Of the 242,463 shares offered to shareholders, only 26,624 shares were subscribed to by others than Hughes Tool Co. The latter took down a total of 124,119 shares to provide the necessary funds to meet the \$5-million requirement in additional capital.

Moreover, under the terms of the same loan agreement, Hughes Tool Co., consented to make an additional \$5 million available to TWA by Dec. 31, 1952, through the purchase of more common stock at subordinated convertible 12% notes. During the calendar year 1952, TWA will be called upon to make expenditures of about \$11,257,000. Of this amount, about \$16 million represents payment of principal and interest on debt. The bulk of the expenditures, \$35.5 million, is to be for the purchase of aircraft and related equipment. Chaired mortgage financing is being used to supplement TWA's capital requirements.

United Rights—The largest stock financing was undertaken by United Air Lines when it offered 225,000 shares of convertible preferred stock through rights, raising about \$21.7 million in the process. This new issue followed shortly on the head corner of a previous public offering. The current issue was good for a conversion rate of 3.15 shares of common stock for each share of preferred and carried a 4½% dividend rate. Stockholders did not elect to subscribe to all the new shares offered and the underwriters were forced to absorb some 48% of the entire issue or about \$8.7 million.

In addition, United arranged for the sale of \$16 million in a new issue of 7½% debentures to increase new money on top of a previous stock sale outstanding in the amount of \$11,518,000. Further, to supplement its payments of interest, a bank credit of \$16 million was arranged in addition to the \$5.4 million outstanding. All of these funds and credits are designed to help meet capital requirements of \$47,158,000 during 1952 and 1953.

Pioneer Success—The most successful public financing belongs to Pioneer Air Lines, Inc. The underwritten total virtually the entire issue of 75,000 additional shares at \$12.16 per share. The company raised \$912.25 net per share or a total of about \$6,872,000 after all expenses.

Together with a bank credit of \$2.5 million and the proceeds of \$1.1 million from the sale of its DC-3 equipment, Pioneer has been able to acquire

E. J. Thomas, President of the Goodyear Tire & Rubber Co., says.

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new fleet of new Minis 20-25 and added a deposit of \$150,000 toward the purchase of five Comstar 140s. The total capital expenditures, including cost of all necessary spare parts and overhauls, training and foundation expenditures, are estimated at \$1.5 million. ■ **WAL** Sales Western Air Lines has agreed to market with a stall, allowing the underwriters were forced to take some more than 20% of the total sale. The total received by the company was some \$1,378,000. A long-term lease for \$1,378,000 was also secured. The company has arranged to provide capital funds also. ■ **WAL** Western will apply these proceeds toward equipment expansion program consisting primarily of the acquisition of five DC-8Bs. The planes also will hold 153 million, upon which gross revenue of \$1.3 million were in strategy.

First to its public stock underwriting at \$11.50 per share, the company netted total some \$234,975 as a result of the exercise of options held by its president, T. C. Drakeville. Total options held were 25,000 shares, which for all practical purposes were exercised at a price of \$9.625 per share. The president achieved a capital gain of \$110,000, and the brokerage firm asked a discount of \$21.248.

X-Effect Petrus—The failure of the truck airline financing, although the companies involved received the full amounts sought, may be expected to have an adverse effect on intercompany industry financing that must be under review. It is noteworthy that the air transport industry is committed for about \$750 million worth of new flight equipment for delivery between now and 1975. American assets that should have been required to be sold in the near future, took capital requirements of the industry during the same time just can easily approach \$750 million.

The credit standing of the airlines must be improved considerably if the required new capital is to be raised on reasonable terms. This will necessarily require sustained good earnings for the period immediately ahead.

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CURCUMIN AND ERYTHROSINE EXTRACTIONS

Further information and advice regarding this research



CHART 3—Payload/cargo weight ratio.

Army and cargo airlines that "from a loading standpoint [the cost of loading costs] is low, utilization, payload factor, having a rectangular cross-section, trackable freight loads, and long loading doors for fast and efficient operations represent the ideal."

But the development stage would be so much higher on an intermediate freight design that it would cause delay until the required material cost Douglas illustrates this comparison in Chart 4. The chart indicates that if the 17 DC-6's now under construction were designed solely for aircraft operations, they would cost \$2,000,000 each, compared with the present price of \$1,100,000 made possible by sharing the development expense with more than 100 passenger planes of the DC-6 series.

Dispersing these prices over seven years, you get direct operating cost of 3.2 cents a mile for the special freighter, and only 3.5 cents for the conventional passenger type.

Other Advantages—Cost Douglas cites some additional advantages of operating passenger-type cargo planes.

- Passenger operation eliminates the extra maintenance approach for conventional freighter.
- Passenger charter for aircraft lease.
- Low accuracy of spare parts needed because of standardization with the big passenger fleet.
- Low training expense for the same reason.
- Equipment interchangeability between aircraft.

• Greater market since the new fleet will include both cargo and passenger operation.

• Cargo Price Coming—In 1960, however, the airfreight market would consist of 115 DC-6's, compared with the average aircraft rate drops to 12 cents a ton-mile. The overnight business then would be almost two-thirds the rate of the passenger-type market, based on Douglas projections of both.

VARIATION OF AIRCRAFT COST WITH QUANTITY

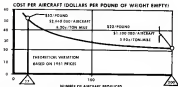


CHART 4—Two air designs built only for freight or modified existing type.

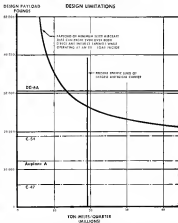


CHART 5—Design payload/traffic release rates.

"An aircraft must continue to be developed in cost regardless that the market for cargo aircraft was one day equal to that of passenger aircraft," Douglas concludes. "Some time before that Douglas is another manufacturer practically will have come up with a strictly cargo plane."

Profit—In the bid for service between the DC-6A, Douglas notes that it is the "best new cargo plane capable of generating a profit at current traffic levels." This conclusion is illustrated graphically in Chart 5, which assumes that the DC-6A and its competitors are built at 1951 prices.

The profit curve shows how dramatically the profit that the "best" traffic level would be, the larger the (new) aircraft must be to break even. "What this actually means is that the smaller the traffic potential at any given volume rate, the lower a carrier must build direct costs, because indirect (overhead) costs are higher as the reduced business volume."

Chart 5 indicates that the DC-6A, "best freighter cargo," gets above the break-even curve only with the DC-6A if you depreciate all competitive craft shows at 1951 construction costs.

About the Douglas Figure—Payload, speed and cost values used by Douglas in this chart are based on a top length of 700 ft.

The "Argonne" A shows in the C-46, priced at 10¢, indicates only in Chart 5, the C-46, according to the chart shown with a "C-46" Douglas attributes the "theoretical economy" of the C-46 is an average investment in the C-46 of \$50,000 per plane.

Italian Airlines Report on 1951

(McGraw-Hill World News)

Rome—Last year Alitalia Co. carried 14,305 passengers and 991,140 lb. of cargo 2,175,964 mi., Rome Aero Division flew 107,806 passengers and 4,378,140 lb. worth 1.5 million mi.

Alitalia's book at the end of the year showed a \$2,000 deficit while LAL made a profit of \$15,000.

During the year Alitalia made a \$300,000 profit on Douglas Aircraft Co. on a fleet of DC-6's, for one intercontinental service during 1951. LAL took over the fleet of Alitalia Republic, using its own fleet of Douglas DC-3 type transports to 76.

Airlines Get Look At Approach Coupler

The airlines already got their first night look at the lightweight Lear F-5 automatic pilot and approach coupler which is going into use in many USAF fighters.

William P. Lear, chairman of Lear, Inc., demonstrated the F-5 in a Lockheed L-1049 in a series of automatic approaches at N. Y. International Airport over a two-day period, to representatives of American Airlines, Pan American Airways, Colonial Airlines, REIL, BOAC and Air France.

With an Avianon Vetter system, Lear made a hands-off approach to within 30 ft. of the ground before he took over the controls. The plane was less than 10,000 ft. to the side of runway center line.

Lower Ceiling—Lear doesn't represent with extremely low automatic approach for safety. The demonstration was intended to show the operation of a special integrator circuit in the Lear approach coupler which prevents the plane from following slight "bumps and ripples" in the glide-path beam. Lear predicted that approach couplers would permit airline couplers to be safely lowered to 100 ft. with a wide visibility.

The F-5 which Lear demonstrated had an installed weight of about 58 lb., according to Lear. It included the basic coupler, a constant barometric altitude control, automatic trim for airspeed, altitude and elevator, and the approach coupler.

Lear indicated that his company's philosophy on airline type airplanes called for "built" control instead of "set" control, designed for some only pilot workmanship. As an example, he said the F-5 would be set to level the plane's maximum pitch maneuver to 3.2 G.

Review of airline interest. Lear says that an F-5 will be installed on DC-6's in the near future to demonstrate its ability to handle high air craft.

Atomic Transports Seen as Next Step

As yet unembodied of plans for air transport may result from the development and application of atomic energy for aircraft. B. G. Pitzer, BANC administration director, believes

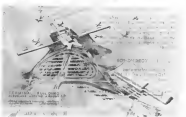
"We may perhaps within eight to ten years have the development of atomic energy used through the jet engine, opened aircraft are possible, but which have hardly begun to be experienced." Pitzer said recently in a speech in Edinburgh. "What is to be done with the development of atomic energy in the event of application of atomic energy?" Every aircraft in speed, provided it could be applied economically, was bound to lead to a further expansion in trade, he added.

He reminded his listeners of the enormous gain in transport has made in the past few years, comparing the 2.5 million air ton-miles carried throughout the world in 1951 to more than 10 million ton-miles in 1951.

Pitzer also pointed out the rapid gain in transport had made in carrying passengers to and from the British Isles, especially when compared with sea routes. In the first seven years, 215,000 (1918), 1,413,000 (1948), 1,775,000 (1951). By sea 5,055,000 (1918), 4,570,000 (1951), 5,334,000 (1951).

Last year the world's airlines carried 70 million passengers, a 25% gain over 1950. In 1951, they carried only 2.5 million. The average number of passengers carried per aircraft had jumped from 1950's 7.7 to last year's 19.9 and the average ton per aircraft from 100 miles to 542 miles.

An cargo has likewise made striking gains, and Pitzer. From 301 million ton-miles in 1947, it has increased to 615 million ton-miles last year, and showed a healthy percentage increase each year.



CLEVELAND TRIES HANGAR-FINANCING PLAN
Lack of instant funds will not stop Cleveland Hopkins Airport from expanding hangar facilities. A proposal continues will now come from the City of Cleveland the necessary loan, then coordinate design, financing and construction of the new facilities (to right at least).



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Air Taxis Are Hit By Copter Regulation

The National Air Tax Conference has asked CAA to drop its new regulation forbidding air taxi operations from flying passengers in any area served by a certificated scheduled passenger helicopter line. Board officials indicate a modified regulation may be issued late this summer, but the Board hasn't even started it yet.

CAA attorneys and staffs admit the Board's regulation was not only harsh but may have violated the Administrative Procedure Act and the due process clause of the Fifth Amendment.

The regulation first proposed by the Board was "Draft Release 47." It merely barred the air taxi operators of rot type. But the final version came out with a rule that outlawed passenger flights between "points" served by certificated passenger copter lines.

"Aeronautical—A point" is defined in the regulations as "any airport or place where aircraft may be landed or taken off, including the area within a 25 mi radius of such airport or place." Thus, when New York Airways starts passenger service this rule will forbid air taxi operations throughout metropolitan New York from its air base in Bridgeport, Conn., to its base in Jamaica, N. Y., for instance. The same is true of metropolitan Los Angeles and Chicago and ultimately

probably all major industrial and commercial areas of the nation as copters come into their own.

The Board issued part of the regulation to protect the copter lines from competition. The theory is that those lines' scheduled copter operations are experiments in the public interest and must be protected from competition. Thus, freedom of operation is order to hold the copter operators' already in a situation.

SHORTLINES

► **Air Transport Association's** Air Corps, Inc. has published a new freight tariff book, including an freight forwarder and other rates and provisions included in these tariff publications. ATA and Short Line Association have shown members of air mail studies in freight schedules taken before them. These lines in many cases had no letters without them.

► **American Airlines** has signed a lease purchase agreement with the Massachusetts Airport Management Board, which will build a \$1.5 million hangar at Logan Airport, Boston. Commissioner McGraw says he hopes ground will be broken "before the year 1975 the year."

► **Boeing Airways** predicts Latin America travel this summer will increase 35% over a year ago, riding by advance reservations. Expansion rates of for savings up to 45% of annual DC-6 fees, Boeing says.

► **Delta Air Lines** says CAA to approve its merger with CAA before their carriers are delivered during the October, "since more than 51 airlines could be based on open ports if the two companies are together by then."

► **Flying Tiger Line** is again making contract figures dropping legal Marine assignments for the Transportation and Nationalization Service. "Without" shift cost is estimated near \$100,000 a month.

► **International Civil Aviation Organization** has voted a 1953 budget of \$2,517,757, of which U.S. pays 27%. A move to consider a site other than Montreal for headquarters was defeated.

► **Take Coastal Airlines** has a temporary annual rate increase of \$26,500 granted by CAA effective Jan. 1, this rate, to prevent payment of working capital during the Board's investigation of alleged financial irregularities by the management.

BANSHEES

KOREA
1951-52

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